Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-6 and 8 are pending in the application, with 1 and 8 being the independent claims. Claim 7 is sought to be cancelled without prejudice to or disclaimer of the subject matter therein. The drawings and the specification are sought to be amended to correct minor typographical errors and formalities. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Examiner Interview

Applicants and their Attorney thank the Examiner for the Examiner Interview conducted on October 18, 2002. During the Examiner Interview, Applicants' Attorney explained Applicants' invention to the Examiner and how the pending claim language distinguishes Applicants' invention from the references applied by the Examiner. In addition, Applicants' Attorney explained to the Examiner drawing and specification changes identified herein.

Objections to the Drawings

In paragraphs 1-5 of the Office Action, the Examiner objected to the drawings under 37 C.F.R. §1.84(p) for allegedly failing to include reference signs mentioned in the text of the application, for using the same reference number to refer to more than one item, for including reference numbers not mentioned in the text of the application, and for using reference numbers that are inconsistent with the text of the application. As discussed with the Examiner during the Examiner Interview, Applicants are submitting herewith changes to the specification and a Request to Correct Drawings to address the Examiner's objections. The changes to the specification and to the drawings do not add new matter. Applicants respectfully request that the Examiner reconsider all outstanding objections to the drawings and that they be withdrawn.

Rejections under 35 U.S.C. § 112

In paragraph 7 of the Office Action, the Examiner rejected claims 2, 7, and 8 under 35 U.S.C. §112, second paragraph, for allegedly failing to particularly point out and distinctly claim the subject matter that applicants regard as their invention. Claim 7 has been cancelled without prejudice to or disclaimer of the subject matter therein. Thus, the objection to claim 7 is moot. As discussed with the Examiner during the Examiner Interview, Applicants are amending claims 2 and 8 to remove the language objected to by the Examiner without narrowing the scope of the claims. Reconsideration and withdrawal of this rejection are respectfully requested.

Rejections under 35 U.S.C. § 103

In paragraph 9 of the Office Action, the Examiner rejected claims 1-5 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,568,023 to Grayer et al. (hereinafter "Grayer") in view of U.S. Patent No. 5,965,991 to Koike et al. (hereinafter "Koike") and U.S. Patent No. 6,175,172 to Bakholdin et al. (hereinafter "Bakholdin"). Applicants respectfully traverse this rejection.

As discussed with the Examiner during the Examiner Interview, Grayer does not teach or suggest the features of claim 1. Grayer recites in the Summary of the Invention, at column 2, lines 8-18, a system characterized by "a voltage drop . . . producing a proportional increase in the speed of the gas turbine to thereby cause increased flow of fuel to the gas turbine and to permit an increase in voltage." As amended, independent claim 1 recites:

> 1. A hybrid electric vehicle power generation system, comprising:
> a turbogenerator/motor;
> a DC bus;
> a first power converter connecting said turbogenerator/motor and said DC bus, said first power converter serving as an AC to DC convertor when power is supplied from said turbogenerator/motor to said DC bus and as a DC to AC convertor when power is supplied from said DC bus to said turbogenerator/motor;
> an energy storage device;
> a second power converter connecting said energy storage device and said DC bus, said second power converter transferring power between said DC bus and said energy storage device;
> said first and second power converters together serving to regulate DC bus voltage to a desired voltage independent of turbogenerator/motor speed.

Thus, at a minimum, Grayer does not disclose or make obvious the feature of "said first and second power converters together serving to regulate DC bus voltage to a desired voltage independent of turbogenerator/motor speed." Neither Koike nor Bakholdin, alone or in combination with Grayer, overcome the deficiencies of Grayer. Since the applied references, alone or in combination, do not teach the features of claim 1, claim 1 is patentable over the applied references. Reconsideration and withdrawal of the rejection of claim 1 are respectfully requested.

Since claims 2-5 depend from independent claim 1 and thus contain all of the features of independent claim 1, dependent claims 2-5 are patentable over the applied references for at least the same reasons that independent claim 1 is patentable over the applied references. Reconsideration and withdrawal of the rejection of claims 2-5 are respectfully requested.

In paragraph 10 of the Office Action, the Examiner rejected claims 6-8 under 35 U.S.C. § 103(a) as being unpatentable over Grayer, Koike, and Bakholdin, as applied to claims 1 and 4, and further in view of U.S. Patent No. 5,806,617 to Yamaguchi (hereinafter "Yamaguchi"). Applicants respectfully traverse this rejection.

As discussed with the Examiner, and as noted above, Grayer, Koike, and Bakholdin, alone or in combination, do not teach the features of claim 1. Yamaguchi does not overcome the deficiencies of Grayer, Koike, and Bakholdin. Thus, the applied references, alone or in combination, do not teach the features of claim 1, and claim 1 is patentable over the applied references. Since claim 6 depends from claim 1 and contains all of the features of claim 1, claim 6 is patentable over the applied references for at least the same reasons that

claim 1 is patentable. Reconsideration and withdrawal of the rejection of claim 6 are respectfully requested.

Features similar to those recited in independent claim 1 are also recited in independent claim 8. Thus, claim 8 is patentable over the applied references for at least the same reasons that claim 1 is patentable. Reconsideration and withdrawal of the rejection of claim 8 are respectfully requested.

Applicants have cancelled claim 7 without prejudice to or disclaimer of the subject matter therein. Thus, the rejection of claim 7 is moot.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Virgil L. Beaston

Virgil L. Beaston
Attorney for Applicant
Registration No. 47,415

Date: 11/1/02

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

Version with markings to show changes made

In the Specification:

In the Specification:

Please substitute the following paragraph for the two paragraphs beginning on page 2, line 8, and ending on page 2, line 17:

[The application of the turbogenerator/motor and associated control electronics to the hybrid electric vehicle overcomes the disadvantages of the reciprocating engine. The turbogenerator/motor power plant is vibration free, has low noise and most significantly has an extremely low level of polluting emissions. The turbogenerator/motor power plant can operate with all conventional hydrocarbon fuels and properly controlled can produce an output voltage independent of turbogenerator/motor speed.

The on-board energy storage devices, such as traction batteries, provide peak power requirements and absorb regenerative braking energy from the vehicle. The turbogenerator/motor performs as a current source providing average energy power and can be started using energy from the on-board energy storage device.]

What is needed is an electric vehicle power system that overcomes the limitations described above.

Please add the following two paragraphs after the paragraph ending on page 4, line 17, and before the paragraph beginning on page 4, line 18:

The application of the turbogenerator/motor and associated control electronics to the hybrid electric vehicle overcomes the disadvantages of the reciprocating engine. The turbogenerator/motor power plant is vibration free, has low noise and most significantly has an extremely low level of polluting emissions. The turbogenerator/motor power plant can

operate with all conventional hydrocarbon fuels and properly controlled can produce an output voltage independent of turbogenerator/motor speed.

The on-board energy storage devices, such as traction batteries, provide peak power requirements and absorb regenerative braking energy from the vehicle. The turbogenerator/motor performs as a current source providing average energy power and can be started using energy from the on-board energy storage device.

Please substitute the following paragraph for the paragraph beginning on page 4, line 18:

One skilled in the art will recognize that the particular configurations shown herein are for illustration purposes only. In particular, the present invention is not limited to the use of a turbogenerator/motor and a HEV battery as shown in Figure 1. Rather, the turbogenerator/motor may be a gas turbine, photovoltaics, [wind turbine] or any other conventional or newly developed energy source. Likewise the HEV battery may be a flywheel, ultracapacitor or any other conventional or newly developed energy storage device on a HEV.

Please substitute the following paragraph for the paragraph beginning on page 14, line 5:

The main CPU processor software communicates data through a TCP/IP stack over intercontroller bus, typically an Ethernet-10 Base-2 interface, to gather data and send commands between power controllers. In accordance with the present invention, the main CPU processor software provides seamless operation of multiple paralleled units as a single larger generator system. One unit, the master, arbitrates the bus and sends commands to all units.

Please substitute the following paragraph for the paragraph beginning on page 14, line 15:

External options port bus [246] 802, which may also be a RS 485 communications link, allows external devices, including but not limited to power meter equipment and auto disconnect switches, to be connected to generator SP 234.

Please substitute the following paragraph for the paragraph beginning on page 17, line 19:

Main CPU 472 begins execution in the "power up" state 322 after power is applied. Transition to the "stand by" state 324 is performed upon successful completing of the tasks of the "power up" state 322. Initiating a start cycle transitions the system to the "prepare to start" state 326 where all system components are initialized for an engine start. The engine then sequences through start states and onto the "run/load" states 344, 346. To shutdown the system, a stop command which sends the system into either "warm down" or "cool down" state 332, 348 is initiated. When the system has finally completed "warm down" or "cool down" process, a transition through the "shut down" state 330 will be made before the system reenters the "standby" state [334] 324 awaiting the next cycle. During any state, detection of a fault with a system severity level indicating the system should not be operated will transition the system state to "fault" state 334. Detection of faults that indicate a processor failure has occurred will transition the system to the "disable" state 336.

Please substitute the following paragraph for the paragraph beginning on page 22, line 7:

In the "disable" state [335] 336 system also disables all outputs placing the system in a safe configuration when faults that prohibit safe operation of the turbine system are present. System monitoring and communications will most likely not continue.

Please substitute the following paragraph for the paragraph beginning on page 17, line 1:

Main CPU 232 issues commands via SPI communications bus 238 to converter SP 236 to execute required converter control functions. Converter SP 236 will operate the converter (not shown) in a DC bus mode or output current mode, as selected by main CPU. In the DC bus voltage mode, converter SP 236 regulates the HEV battery power provided by power controller 230 to maintain the internal bus voltage at the setpoint. In the output current mode, the converter SP 236 uses power from the DC bus to provide commanded current out of the converter. DC bus 462 (see Figure 10) supplies power for logic power, external components and system power output.

In the Claims:

Please cancel claim 7 without prejudice to or disclaimer of the subject matter therein.

Please substitute the following claim 1 for the pending claim 1:

1. (ONCE AMENDED) A hybrid electric vehicle power generation system, comprising:

a turbogenerator/motor;

a DC bus;

a first power converter connecting said turbogenerator/motor and said DC bus, said first power converter serving as an AC to DC convertor when power is supplied from said turbogenerator/motor to said DC bus and as a[n] DC to AC convertor when power is supplied from said DC bus to said turbogenerator/motor [during start up and operation of said turbogenerator/motor];

an [hybrid electric vehicle] energy storage device;

a second power converter connecting said [hybrid electric vehicle] energy storage device and said DC bus, said second power converter transferring power between said DC bus and said [hybrid electric vehicle] energy storage device;

said first and second power converters together serving [as a power controller to provide a distributed power system] to regulate [said] DC bus voltage to a desired voltage independent of turbogenerator/motor speed.

Please substitute the following claim 2 for the pending claim 2:

2. (ONCE AMENDED) The [turbogenerator/motor control] system of claim 1 wherein said turbogenerator/motor [is] includes a permanent magnet [turbogenerator/motor] rotor.

Please substitute the following claim 3 for the pending claim 3:

3. (ONCE AMENDED) The [turbogenerator/motor control] system of claim 1 [and in addition], further comprising:

a resistive load connected across said DC bus to dissipate power from said DC bus whenever [said] DC bus voltage exceeds the desired voltage.

Please substitute the following claim 4 for the pending claim 4:

4. (ONCE AMENDED) The [turbogenerator/motor control] system of claim 1 wherein said [hybrid electric vehicle] energy storage device is a battery.

Please substitute the following claim 5 for the pending claim 5:

5. (ONCE AMENDED) The [turbogenerator/motor control] system of claim 1 wherein said [hybrid electric vehicle] energy storage device is a flywheel.

Please substitute the following claim 6 for the pending claim 6:

6. (ONCE AMENDED) The [turbogenerator/motor control] system of claim 1 wherein said [hybrid electric vehicle] energy storage device is an ultracapacitor.

Please substitute the following claim 8 for the pending claim 8:

8. (ONCE AMENDED) A hybrid electric vehicle power generation system, comprising:

a DC bus;

a permanent magnet turbogenerator/motor;

a [hybrid electric vehicle] battery;

a power controller [to provide a distributed generation power system to] that regulates [said] DC bus voltage to a desired voltage independent of permanent magnet turbogenerator/motor speed, said power controller having

a first power converter, connecting said permanent magnet turbogenerator/motor and said DC bus, that [serving] serves as an AC to DC convertor when power is supplied from said permanent magnet turbogenerator/motor to said DC bus and as a DC to AC convertor when power is supplied from said DC bus to said permanent magnet turbogenerator/motor,

a second power converter, connecting said [hybrid electric vehicle] battery and said DC bus, that [serving] serves as a DC to DC converter when power is supplied from said DC bus to said [hybrid electric vehicle] battery and as a reverse DC to DC converter when power is supplied from said [hybrid electric vehicle] battery to said DC bus[, and

means to detect transients associated with any of said permanent magnet turbogenerator/motor and said hybrid electric vehicle battery]; and

a resistive load connected across said DC bus to dissipate power from said DC bus whenever [said] DC bus voltage exceeds the desired voltage.

In the Drawings:

Please substitute updated Figures 6, 7, 8, 9, and 10, filed herewith as part of a Request to Correct Drawings, for pending Figures 6, 7, 8, 9, and 10.